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EXAMINER	
QUINLAN, RONALD A	

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Please find below and/or attached an Office communication concerning this application or proceeding.

The time period for reply, if any, is set in the attached communication.

Office Action Summary	Application No.	Applicant(s)	
	10/591,458	MORIGUCHI ET AL.	
	Examiner	Art Unit	
	Ronald A. Quinlan	1794	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE *3* MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *15 October 2009*.

2a)☒ This action is **FINAL**. 2b)☐ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *1-32* is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *1-32* is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☐ The drawing(s) filed on _____ is/are: a)☐ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☐ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☒ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☐ Information Disclosure Statement(s) (PTO/SB/08) Paper No(s)/Mail Date _____.
4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____.
5) ☐ Notice of Informal Patent Application
6) ☐ Other: _____.

DETAILED ACTION

Claim Rejections - 35 USC § 103

1. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

2. The factual inquiries set forth in Graham v. John Deere Co., 383 U.S. 1, 148 USPQ 459 (1966), that are applied for establishing a background for determining obviousness under 35 U.S.C. 103(a) are summarized as follows:

1. Determining the scope and contents of the prior art.
2. Ascertaining the differences between the prior art and the claims at issue.
3. Resolving the level of ordinary skill in the pertinent art.
4. Considering objective evidence present in the application indicating obviousness or nonobviousness.

3. This application currently names joint inventors. In considering patentability of the claims under 35 U.S.C. 103(a), the examiner presumes that the subject matter of the various claims was commonly owned at the time any inventions covered therein were made absent any evidence to the contrary. Applicant is advised of the obligation under 37 CFR 1.56 to point out the inventor and invention dates of each claim that was not commonly owned at the time a later invention was made in order for the examiner to consider the applicability of 35 U.S.C. 103(c) and potential 35 U.S.C. 102(e), (f) or (g) prior art under 35 U.S.C. 103(a).

4. Claims 1-32 are rejected under 35 U.S.C. 103(a) as being unpatentable over JP 2001-353603 to Fukaya et al., hereinafter referred to as "Fukaya", in view of US 6,066,399 to Hirano et al., hereinafter referred to as "Hirano", in view of Sheeja et al., Tribological properties and adhesive strength of DLC coatings prepared under different substrate bias voltages, Wear 249 (2001), pg. 433-439, hereinafter referred to as "Sheeja" and as evidenced by Materials Science of Thin Films, Deposition and Structure, Milton Ohring, 2nd Ed., 2004, hereinafter referred to as "Ohring".

5. With respect to Claim 1, Fukaya (see machine translation) teaches a surface-coated cutting tool (paragraph [0006]), comprising a base material (paragraph [0009]), and a coated film formed on said base material (paragraph [0009]), wherein said coated film serves as an outermost layer on said base material and has compressive stress (paragraph [0009]). Said compressive stress is varied so as to have a strength distribution in a direction of thickness of said coated film (paragraph [0012]-[0013], Figures 2-5). Fukaya teaches that having a maximum compressive stress at the top surface of a coating is desirable for providing maximum toughness (paragraphs [0007] and [0012] and also that decreasing the compressive stress from the substrate to the surface of the film so that a minimum compressive stress is located at the top surface of the coating is desirable for enhanced abrasion resistance (paragraphs [0007] and [0013]). Fukaya further teaches said strength distribution is characterized in that the compressive stress at the surface of said coated film continuously decreases from said top surface of said coated film toward the bottom surface of said coated film (Figure 2). Fukaya teaches the stepwise decrease of said compressive stress from said top surface

of said coated film toward the bottom surface of said coated film (Figure 3). Fukaya teaches the deposition of said layers through PVD techniques (paragraph [0029]).

6. Fukaya does not teach that said strength distribution is characterized in that the compressive stress at a surface of said coated film continuously decreases from said top surface of said coated film toward a first intermediate point located between said surface of said coated film and a bottom surface of said coated film and the compressive stress attains a relative minimum point at said first intermediate point.

7. Hirano teaches a hard carbon thin film as a protective coating on blades such as razor blades (col. 1, lines 12-21). Hirano teaches the hard carbon thin film as being formed on a base material (col. 2, lines 6-9) and a hardness and internal stress gradient through the carbon layer which serves as the outermost layer on the base material (col. 8, line 60 - col. 9, line 2). Hirano further teaches an example (col. 10, Example 1) in which the carbon thin film has a graded structure in which the sp^2/sp^3 ratio is high near the substrate side of the coating, but decreases to near zero for the overlying film through the thickness of the film (col. 10, lines 54-65 and Figures 2 and 4). Hirano teaches that the sp^2/sp^3 ratio is related to hardness and internal stress in the layers (col. 8, line 60 - col. 9, line 2).

8. Hirano also teaches an example (col. 13, Example 4) in which the carbon thin film has a graded structure in which the sp^2/sp^3 ratio once decreases from a substrate/film interface to a minimum at an intermediate thickness of the thin film, and then increases therefrom toward a surface of the thin film (col. 13, lines 6-10 and Figure 5). This can be constructed as the combination of a two layer system. A first layer,

wherein the compressive stress gradient increases from the substrate/film interface to the top surface of the film and a second layer, wherein the compressive stress decreases from the first layer/second layer interface to the top surface of the second layer. The combination of these two layers results in the stress gradient that is illustrated by Hirano (Example 4).

9. Hirano further teaches that ion species, associated with formation of the thin film, in a plasma are varied in kinetic energy with film-forming time, so that the sp^2/sp^3 ratio in the hard carbon thin film is varied in its thickness direction, and that in order to vary the kinetic energies of those ion species, an acceleration voltage may be applied to them (col. 3, lines 35-40). Hirano also teaches utilizing different acceleration voltages to change the sp^2/sp^3 ratio at the surface of the film and throughout the thickness of the film. Hirano does not expressly explain that that high internal stress associated with the low sp^2/sp^3 ratio is compressive stress.

10. However, Sheeja discloses deposition of a high-hardness carbon film under different substrate bias voltages. Sheeja shows that compressive stresses are formed in hard carbon films from the formation of sp^3 carbon (low sp^2/sp^3 ratio) (page 433, 1. Introduction and page 435, 3.3 Compressive stress of the film). Sheeja illustrates that a compressive stress of 10GPa is obtained when a substrate bias of 85 V is utilized and the value is lower, approximately 1GPa, when the substrate bias is higher, e.g., greater than 3000 V (page 435, 3.3 Compressive stress of the film and Figure 3).

11. Therefore, one of ordinary skill in the art would expect the high internal stress as taught by Hirano to inherently be compressive stress as taught by Sheeja. Hence

the stress distribution as taught by Hirano is characterized in that the compressive stress at the surface of the coated film decreases from the top surface toward an intermediate point located between said surface and the substrate/film interface and that the compressive stress attains a relative minimum point at the intermediate point.

12. It is well known in the art that accelerating ions toward the substrate and bombarding the surface induces compressive stress in a film, as it is considered atomic peening action, as evidenced by Ohring (pages 184 and 748). Ohring also teaches that it is well known in the art that substrate biasing may be used to induce compressive stress in thin films and that by increasing the bias the internal stress of thin films may reverse from tensile to compressive (page 748, section 12.5.3.3 and page 749, table 12-2). Because of this, the teachings of Hirano as evidenced by Sheeja may seem counter intuitive. That compressive stress is induced in the film by "lowering" the acceleration voltage. However, Sheeja teaches the reason for this apparent anomaly. Sheeja explains that for carbon atoms, 85 V substrate bias is the optimum ion energy from a balance between the incident carbon ions having sufficient energy to penetrate the surface atomic layer, while minimizing the excess energy, which is dissipated during the growth. In the case of deposition at high substrate bias voltages, the excess energy may convert some of the sp^3 bonded to sp^2 bonded carbon atoms (page 435, 3.3 Compressive stress of the film). It is therefore considered well known in the art that for carbon films, the norm holds true for the acceleration of ions up to 85 V, but then the excess energy begins converting sp^3 bonded atoms to sp^2 bonded carbon atoms.

13. It should also be noted that when the substrate bias or acceleration voltage is mentioned without the use of a minus sign ("-"), there is not a different value attached. The values are taken simply as absolutes and are used to indicate the potential imparted to ions accelerating toward the surface to be coated.

14. It should be noted for convenience that as interpreted by the teachings of Hirano in view of Sheeja, lower acceleration voltages for carbon films results in lower sp^2/sp^3 ratios, which results in higher compressive stresses and that higher acceleration voltage for carbon films results in higher sp^2/sp^3 ratios and lower compressive stresses.

15. Therefore it would have been obvious to one of ordinary skill in the art at the time of the invention to combine the compressive stress coating of Fukaya via the two layer profile of Hirano in view of Sheeja and Ohring so that the compressive stress decreases from the surface of the coating to some intermediate point wherein said compressive stress reaches a relative minimum point at said intermediate point. One of ordinary skill in the art at the time of the invention would have been motivated to do this to provide a film with excellent toughness and excellent abrasion resistance.

16. With respect to Claim 2, Hirano further teaches that the acceleration voltage is held constant for the first minute of growth and then decreased to 200V for the final 19 minutes of growth. This results in compressive stress value that is considered constant for the first minute of growth to some intermediate point, where a local minimum in the compressive stress is reached and which point it is then increased to the surface of the film.

17. Sheeja teaches that forming the carbon film with a high substrate bias, i.e., a high sp^2/sp^3 ratio, results in a slightly lower coefficient of friction (page 432, Figure 7) and that this may be desirable because the graphitic structure of the sp^2 carbon acts as a solid lubricant on the surface of the film (page 438, 4. Discussion). Sheeja also teaches that a low sp^2/sp^3 ratio film, formed with a lower substrate bias, results in a harder film with a much lower wear rate (page 432, Figure 8). Sheeja further teaches that one of ordinary skill in the art at the time of the invention would be motivated to optimize the substrate bias during the formation of the hard film (page 438, 5. Conclusion). Sheeja teaches forming the films at constant substrate biases (page 434, 2.1 Preparation of DLC film).

18. Therefore it would have been obvious to one of ordinary skill in the art at the time of the invention to modify the coatings of Fukaya by the two layer profile of Hirano in view of Sheeja and as evidenced by Ohring. One of ordinary skill in the art at the time of the invention would have been motivated to do this to provide a film with excellent toughness and excellent abrasion resistance.

19. With respect to Claim 3, Fukaya teaches that the compressive stress is in the range of 0 to 10GPa (paragraph [0009]). Sheeja further teaches that a substrate bias of 85 V results in a compressive stress of ~10GPa (page 435, 3.3 Compressive stress of the film, Figure 3) and that a substrate bias of greater than 3000 V is ~1GPa (page 435, 3.3 Compressive stress of the film, Figure 3). Therefore it would be expected by one of ordinary skill in the art that the compressive stress at any point in the film of Hirano in

view of Sheeja as evidenced by Ohring would be in the range from at least -10GPa to at most -1GPa, as shown in Sheeja (Figure 3).

20. Therefore it would have been expected by one of ordinary skill in the art that the compressive stress of the film of Fukaya in view of Hirano in view of Sheeja as evidenced by Ohring would be in the range of 0 - 10GPa.

21. With respect to Claim 4, Fukaya teaches films of similar thicknesses (Table 3). Therefore the combination of the two films would be considered to have an interface, i.e., intermediate point, at ~50% of the film's thickness. Hirano in view of Sheeja, as evidenced by Ohring teaches varying the acceleration voltage in a controlled fashion such that it starts at 2000 V, is varied in a constant manner to a minimum at 10 minutes and then increased back to the starting point of 2000 V (col. 13, Example 4, lines 19-25, Figure 13). The film forming time is shown to be 20 minutes (Figure 13). The intermediate point is interpreted as being located at a position distant from the top surface of the coated film by 50% of the thickness of the film.

22. Therefore it would have been obvious to one of ordinary skill in the art at the time of the invention to modify the coatings of Fukaya in view of the two layer profile of Hirano in view of Sheeja as evidenced by Ohring resulting in an intermediate point located at a position distant from the top surface of the coated film by at least 0.1 to at most 50% of the thickness of the film. One of ordinary skill in the art at the time of the invention would have been motivated to do this to provide a film with excellent abrasion resistance and excellent toughness as taught by Fukaya.

23. With respect to Claim 5, Fukaya has disclosed that the compressive stress is between 0 and 10GPa (paragraph [0009]). Fukaya also teaches that the compressive stress should change by approximately 1GPa (Figures 3, 4, 5 and 6). Fukaya also discloses that a compressive stress value, i.e., absolute value, of less than 1GPa was not recognized (paragraph [0010]). Fukaya further teaches specific examples, i.e., Example 1 and Example 12, wherein the compressive stress at the substrate surface is approximately 12% and 43% of the compressive stress at the surface of the film (Table 3).

24. Hirano in view of Sheeja as evidenced by Ohring teaches forming a compressive stress at the surface utilizing 2000 V and 200 V at the intermediate point. Sheeja shows that the compressive stress associated with 85 V is ~10 GPa and 3000 V is ~1 GPa.

25. Fukaya in view of Hirano in view of Sheeja as evidenced by Ohring does not expressly teach the compressive stress at the first intermediate point of the film set to a value comparable to 20 to 90% of the compressive stress at the surface of the coated film.

26. However, based on the curve indicated by the data of Sheeja (Figure 3), it would have been expected by one of ordinary skill in the art at the time of the invention, that the compressive stress of Hirano would be greater than 1GPa at the ending acceleration voltage of 2000 V and less than 10GPa at the intermediate acceleration voltage of 200 V. It also would be expected of one of ordinary skill in the art to modify the ratio of compressive stress at the surface and said intermediate point for the

purpose of increasing adhesion between layers/phases and preventing delamination of the film.

27. Therefore, because the smallest value of 1GPa is 10% of the largest value of 10GPa, one of ordinary skill in the art would expect that the compressive stress at the intermediate point of Fukaya in view of Hirano in view of Sheeja as evidenced by Ohring would be about 90% of the compressive stress at the surface of the film.

28. It also would have been obvious to one of ordinary skill in the art at the time of the invention to modify the coatings of Fukaya by the two layer profile as taught by Hirano in view of Sheeja as evidenced by Ohring via the optimization as taught by Sheeja to vary the compressive stress value of the intermediate point so that it was set to 20 to 90% of the compressive stress at the surface of the coated film. One of ordinary skill in the art at the time of the invention would have been motivated to do this to provide a film with excellent abrasion resistance and excellent toughness as taught by Fukaya.

29. With respect to Claim 6, Fukaya teaches an example (Table 3, Example 12), wherein the compressive stress at the substrate is approximately 42% of the compressive stress at the surface. Fukaya in view of Hirano in view of Sheeja as evidenced by Ohring does not expressly teach a compressive stress value for the first intermediate point of the film being set at a value comparable to 40 to 80 % of the compressive stress at the surface of the coated film. However, it would be expected of one of ordinary skill in the art to modify the ratio of compressive stress at the surface and said intermediate point for the purpose of increasing adhesion between

layers/phases and preventing delamination of the film and to determine the best ratio for excellent toughness and abrasion resistance.

30. Therefore it would have been obvious to one of ordinary skill in the art at the time of the invention to modify the coatings of Fukaya by the two layer profile as taught by Hirano via the optimization as taught by Sheeja to vary the compressive stress value of the intermediate point so that it was set to 40 to 80 % of the compressive stress at the surface of the coated film. One of ordinary skill in the art at the time of the invention would have been motivated to do this to provide a film with excellent abrasion resistance and excellent toughness as taught by Fukaya.

31. With respect to Claim 7, Fukaya teaches an example wherein the maximum compressive stress is attained at the surface of said coated film and is maintained across a prescribed distance from said surface toward an intermediate point and after this point the compressive stress continues to decrease in a stepwise fashion (Figure 3). Fukaya also teaches an example in which the compressive stress is continuously decreased from the surface of the film to the substrate (Figure 2).

32. Hirano teaches an example in which the acceleration voltage is held constant for the last minute of film growth after increasing the voltage from a maximum compressive stress at the intermediate point (col. 13, Example 4, lines 19-25, Figure 13). This is interpreted as maintaining the compressive stress across a distance from the surface of the film and then increasing the compressive stress to a first intermediate point.

33. Therefore it would have been obvious to one of ordinary skill in the art at the time of the invention to modify the coatings of Fukaya in view of the two layer profile as

taught by Hirano in view of Sheeja as evidenced by Ohring so that the compressive stress is a maximum at the surface, is maintained across some prescribed distance toward the intermediate point and then decreased continuously to the substrate. Fukaya teaches that one of ordinary skill in the art would prefer the compressive stress at a maximum on the surface for excellent toughness. One of ordinary skill in the art at the time of the invention would have been motivated to do this to provide a film with excellent abrasion resistance and excellent toughness as taught by Fukaya.

34. With respect to Claim 8, Fukaya teaches continuously decreasing the compressive stress from the surface to the substrate (Figure 2). Fukaya also teaches continuously increasing the compressive from the surface of the film to the substrate (Figure 4).

35. Therefore it would have been obvious to one of ordinary skill in the art at the time of the invention to modify the coatings of Fukaya in view of the two layer profile as taught by Hirano in view of Sheeja as evidenced by Ohring so that the compressive stress is a maximum at the surface, continually decreases from said surface to the intermediate point and then continually increases toward the substrate. One of ordinary skill in the art at the time of the invention would have been motivated to do this to provide a film with excellent abrasion resistance and excellent toughness as taught by Fukaya.

36. With respect to Claim 9, Fukaya teaches that the compressive stress is in the range of 0 to 10GPa (paragraph [0009]). Sheeja further teaches that a substrate bias of 85 V results in a compressive stress of about 10GPa (page 435, 3.3 Compressive

stress of the film, Figure 3) and that a substrate bias of greater than 3000 V is approximately 1GPa (page 435, 3.3 Compressive stress of the film, Figure 3). Therefore it would be expected by one of ordinary skill in the art that the compressive stress at any point in the film of Hirano in view of Sheeja as evidenced by Ohring would be in the range from at least -10GPa to at most -1GPa, as shown in Sheeja (Figure 3).

37. Therefore it would have been expected by one of ordinary skill in the art that the film of Fukaya in view of Hirano in view of Sheeja as evidenced by Ohring would be in the range of at least -15GPa to at most 0GPa.

38. With respect to Claim 10, Fukaya teaches films of similar thicknesses (Table 3). Hirano in view of Sheeja, as evidenced by Ohring teaches varying the acceleration voltage in a controlled fashion such that it starts at 2000 V, is varied in a constant manner to a minimum at 10 minutes and then increased back to the starting point of 2000 V (col. 13, Example 4, lines 19-25, Figure 13). The film forming time is shown to be 20 minutes (Figure 13). The intermediate point is interpreted as being located at a position distant from the top surface of the coated film by 50% of the thickness of the film.

39. Therefore it would have been obvious to one of ordinary skill in the art at the time of the invention to modify the coatings of Fukaya in view of the two layer profile of Hirano in view of Sheeja as evidenced by Ohring resulting in an intermediate point located at a position distant from the top surface of the coated film by 50% of the thickness of the film. One of ordinary skill in the art at the time of the invention would

have been motivated to do this to provide a film with excellent abrasion resistance and excellent toughness as taught by Fukaya.

40. With respect to Claim 11, Fukaya teaches forming a film wherein the compressive stress attains a maximum at the surface (paragraph [0007] and Figures 2 and 3).

41. Therefore it would have been obvious to one of ordinary skill in the art at the time of the invention to modify the coatings of Fukaya in view of the two layer profile of Hirano in view of Sheeja as evidenced by Ohring. One of ordinary skill in the art at the time of the invention would have been motivated to do this to provide a film with excellent abrasion resistance and excellent toughness as taught by Fukaya.

42. With respect to Claim 12, Fukaya has disclosed that the compressive stress is between 0 and 10GPa (paragraph [0009]). Fukaya also teaches that the compressive stress should change by approximately 1GPa (Figures 3, 4, 5 and 6). Fukaya also discloses that a compressive stress value, i.e., absolute value, of less than 1GPa was not recognized (paragraph [0010]). Fukaya further teaches specific examples, i.e., Example 1 and Example 12, wherein the compressive stress at the substrate surface is approximately 12% and 43% of the compressive stress at the surface of the film (Table 3).

43. Hirano in view of Sheeja as evidenced by Ohring teaches forming a compressive stress at the surface utilizing 2000 V and 200 V at the intermediate point. Sheeja shows that the compressive stress associated with 85 V is ~10 GPa and 3000 V is ~1 GPa.

44. Fukaya in view of Hirano in view of Sheeja as evidenced by Ohring does not expressly teach the compressive stress at the first intermediate point of the film set to a value comparable to 20 to 90% of the compressive stress at the surface of the coated film.

45. However, based on the curve indicated by the data of Sheeja (Figure 3), it would have been expected by one of ordinary skill in the art at the time of the invention, that the compressive stress of Hirano would be greater than 1 GPa at the ending acceleration voltage of 2000 V and less than 10 GPa at the intermediate acceleration voltage of 200 V. It also would be expected of one of ordinary skill in the art to modify the ratio of compressive stress at the surface and said intermediate point for the purpose of increasing adhesion between layers/phases and preventing delamination of the film as taught by Sheeja.

46. Therefore, because the smallest value of 1 GPa is 10% of the largest value of 10 GPa, one of ordinary skill in the art would expect that the compressive stress at the intermediate point of Fukaya in view of Hirano in view of Sheeja as evidenced by Ohring would be about 90% of the compressive stress at the surface of the film.

47. It also would have been obvious to one of ordinary skill in the art at the time of the invention to modify the coatings of Fukaya by the two layer profile as taught by Hirano in view of Sheeja as evidenced by Ohring via the optimization as taught by Sheeja to vary the compressive stress value of the intermediate point so that it was set to 20 to 90% of the compressive stress at the surface of the coated film. One of ordinary skill in the art at the time of the invention would have been motivated to do this

to provide a film with excellent abrasion resistance and excellent toughness as taught by Fukaya.

48. With respect to Claim 13, Fukaya teaches an example (Table 3, Example 12), wherein the compressive stress at the substrate is approximately 42% of the compressive stress at the surface of the film. Fukaya in view of Hirano in view of Sheeja as evidenced by Ohring does not expressly teach a compressive stress value for the first intermediate point of the film being set at a value comparable to 40 to 80 % of the compressive stress at the surface of the coated film. However, it would be expected of one of ordinary skill in the art to modify the ratio of compressive stress at the surface and said intermediate point for the purpose of increasing adhesion between layers/phases and preventing delamination of the film as taught by Sheeja.

49. Therefore it would have been obvious to one of ordinary skill in the art at the time of the invention to modify the coatings of Fukaya by the two layer profile as taught by Hirano in view of Sheeja as evidenced by Ohring via the optimization as taught by Sheeja to vary the compressive stress value of the intermediate point so that it was set to 40 to 80 % of the compressive stress at the surface of the coated film. One of ordinary skill in the art at the time of the invention would have been motivated to do this to provide a film with excellent abrasion resistance and excellent toughness as taught by Fukaya.

50. With respect to Claim 14, Fukaya teaches an example wherein the maximum compressive stress is attained at the surface of said coated film and is maintained across a prescribed distance from said surface toward a first intermediate point and

after this point the compressive stress continues to decrease in a stepwise fashion (Figure 3). Fukaya also teaches an example in which the compressive stress is continuously decreased from the surface of the film to the substrate (Figure 2).

51. Therefore it would have been obvious to one of ordinary skill in the art at the time of the invention to modify the coatings of Fukaya in view of the two layer profile as taught by Hirano in view of Sheeja as evidenced by Ohring so that the compressive stress is a maximum at the surface, is maintained across some prescribed distance toward the intermediate point and then decreased continuously to the substrate. One of ordinary skill in the art at the time of the invention would have been motivated to do this to provide a film with excellent abrasion resistance and excellent toughness as taught by Fukaya.

52. With respect to Claim 15, Fukaya teaches varying the compressive stress in a stepwise manner (Figures 3 and 5). Fukaya does not teach a strength distribution is characterized in that said compressive stress continuously increases from said first intermediate point toward a second intermediate point located between said first intermediate point and said bottom surface of said coated film and attains a relative maximum point at said second intermediate point.

53. Hirano in view of Sheeja as evidenced by Ohring teaches holding the acceleration voltage constant for the first minute of film growth and then decreasing the voltage continuously to the intermediate point. This is interpreted as decreasing the compressive stress from a maximum at the intermediate point toward a second

intermediate point located between the first intermediate point and the bottom surface of the film (col. 13, Example 4, lines 19-25, Figure 13).

54. Therefore it would have been obvious to one of ordinary skill in the art at the time of the invention to modify the coatings of Fukaya in view of the two layer profile as taught by Hirano in view of Sheeja as evidenced by Ohring. One of ordinary skill in the art at the time of the invention would have been motivated to do this to provide a film with excellent abrasion resistance and excellent toughness as taught by Fukaya.

55. With respect to Claim 16, Fukaya teaches that the compressive stress is in the range of 0 to 10GPa (paragraph [0009]). Sheeja further teaches that a substrate bias of 85 V results in a compressive stress of about 10GPa (page 435, 3.3 Compressive stress of the film, Figure 3) and that a substrate bias of greater than 3000 V is approximately 1GPa (page 435, 3.3 Compressive stress of the film, Figure 3). Therefore it would be expected by one of ordinary skill in the art that the compressive stress at any point in the film of Hirano in view of Sheeja as evidenced by Ohring would be in the range from at least -10GPa to at most -1GPa, as shown in Sheeja (Figure 3).

56. Therefore it would have been expected by one of ordinary skill in the art that the film of Fukaya in view of Hirano in view of Sheeja as evidenced by Ohring would be in the range of at least -15 GPa to at most 0 GPa.

57. With respect to Claim 17, Fukaya teaches films of similar thicknesses (Table 3). Fukaya also teaches forming steps in the compressive stress profile located approximately at $1/8^{th}$ (approximately 12.5%) intervals of the film thickness (Figure 3). Fukaya does not teach a first intermediate point that is located at a position distant from

said surface of said coated film by at least 0.1% to at most 50% of the thickness of said coated film.

58. Hirano in view of Sheeja, as evidenced by Ohring teaches varying the acceleration voltage in a controlled fashion such that it starts at 2000 V, is varied in a constant manner to a minimum at 10 minutes and then increased back to the starting point of 2000 V (col. 13, Example 4, lines 19-25, Figure 13). The film forming time is shown to be 20 minutes (Figure 13). The intermediate point is interpreted as being located at a position distant from the top surface of the coated film by 50 % of the thickness of the film.

59. Therefore it would have been obvious to one of ordinary skill in the art at the time of the invention to modify the coatings of Fukaya in view of the two layer profile of Hirano in view of Sheeja as evidenced by Ohring resulting in an intermediate point located at a position distant from the top surface of the coated film by at least 0.1% to at most 50% of the thickness of the film. One of ordinary skill in the art at the time of the invention would have been motivated to do this to provide a film with excellent abrasion resistance and excellent toughness as taught by Fukaya.

60. With respect to Claim 18, Fukaya teaches films of similar thicknesses (Table 3). Fukaya also teaches forming steps in the compressive stress profile located approximately at $1/8^{th}$ (approximately 12.5%) intervals of the film thickness (Figure 3). Therefore the second point is located at approximately 25% of the films thickness from the surface. Fukaya does not teach a first intermediate point that is located at a position

distant from said surface of said coated film by at least 0.2% to at most 95% of the thickness of said coated film.

61. Hirano in view of Sheeja as evidenced by Ohring teaches that the second intermediate point is formed after 1 minute of film growth and that the total film growth is 20 minutes. Therefore the second intermediate point is considered to be formed at 95 % of the thickness of the coated film.

62. Therefore it would have been obvious to one of ordinary skill in the art at the time of the invention to modify the coatings of Fukaya in view of the two layer profile as taught by Hirano in view of Sheeja as evidenced by Ohring. One of ordinary skill in the art at the time of the invention would have been motivated to do this to provide a film with excellent abrasion resistance and excellent toughness as taught by Fukaya.

63. With respect to Claim 19, Fukaya teaches forming a maximum compressive stress at the surface of the coating (paragraph [0007] and Figures 2 and 3).

64. With respect to Claim 20, Fukaya has disclosed that the compressive stress is between 0 and 10GPa (paragraph [0009]). Fukaya also teaches that the compressive stress should change by approximately 1GPa (Figures 3, 4, 5 and 6). Fukaya also discloses that a compressive stress value, i.e., absolute value, of less than 1GPa was not recognized (paragraph [0010]). Fukaya further teaches specific examples, i.e., Example 1 and Example 12, wherein the compressive stress at the substrate surface is approximately 12% and 43% of the compressive stress at the surface of the film (Table 3).

65. Hirano in view of Sheeja as evidenced by Ohring teaches forming a compressive stress at the surface utilizing 2000 V and 200 V at the intermediate point. Sheeja shows that the compressive stress associated with 85 V is ~10 GPa and 3000 V is ~1 GPa.

66. Fukaya in view of Hirano in view of Sheeja as evidenced by Ohring does not expressly teach the compressive stress at the first intermediate point of the film set to a value comparable to 20 to 90% of the compressive stress at the surface of the coated film.

67. However, based on the curve indicated by the data of Sheeja (Figure 3), it would have been expected by one of ordinary skill in the art at the time of the invention, that the compressive stress of Hirano would be greater than 1 GPa at the ending acceleration voltage of 2000 V and less than 10 GPa at the intermediate acceleration voltage of 200 V. It also would be expected of one of ordinary skill in the art to modify the ratio of compressive stress at the surface and said intermediate point for the purpose of increasing adhesion between layers/phases and preventing delamination of the film.

68. Therefore, because the smallest value of 1 GPa is 10% of the largest value of 10 GPa, one of ordinary skill in the art would expect that the compressive stress at the intermediate point of Fukaya in view of Hirano in view of Sheeja as evidenced by Ohring would be about 90% of the compressive stress at the surface of the film.

69. It also would have been obvious to one of ordinary skill in the art at the time of the invention to modify the coatings of Fukaya by the two layer profile as taught by Hirano in view of Sheeja as evidenced by Ohring via the optimization as taught by

Sheeja to vary the compressive stress value of the intermediate point so that it was set to 20 to 90% of the compressive stress at the surface of the coated film. One of ordinary skill in the art at the time of the invention would have been motivated to do this to provide a film with excellent abrasion resistance and excellent toughness as taught by Fukaya.

70. With respect to Claim 21, Fukaya teaches an example (Table 3, Example 12), wherein the compressive stress at the substrate is approximately 42% of the compressive stress at the surface. Fukaya in view of Hirano in view of Sheeja as evidenced by Ohring does not expressly teach a compressive stress value for the intermediate point of the film being set at a value comparable to 40 to 80 % of the compressive stress at the surface of the coated film. However, it would be expected of one of ordinary skill in the art to modify the ratio of compressive stress at the surface and said intermediate point for the purpose of increasing adhesion between layers/phases and preventing delamination of the film.

71. Therefore it would have been obvious to one of ordinary skill in the art at the time of the invention to modify the coatings of Fukaya by the two layer profile as taught by Hirano in view of Sheeja as evidenced by Ohring via the optimization as taught by Sheeja to vary the compressive stress value of the surface so that it was set to 40 to 80 % of the compressive stress at the intermediate point of the coated film. One of ordinary skill in the art at the time of the invention would have been motivated to do this to provide a film with excellent abrasion resistance and excellent toughness as taught by Fukaya.

72. With respect to Claim 22, Fukaya teaches an example wherein the maximum compressive stress is attained at the surface of said coated film and is maintained across a prescribed distance from said surface toward a first intermediate point and after this point the compressive stress continues to decrease in a stepwise fashion (Figure 3). Fukaya also teaches an example in which the compressive stress is continuously decreased from the surface of the film to the substrate (Figure 4).

73. Therefore it would have been obvious to one of ordinary skill in the art at the time of the invention to modify the coatings of Fukaya in view of the two layer profile as taught by Hirano in view of Sheeja as evidenced by Ohring so that the compressive stress is a maximum at the surface, is maintained across some prescribed distance toward the intermediate point and then decreased continuously to the substrate. One of ordinary skill in the art at the time of the invention would have been motivated to do this to provide a film with excellent abrasion resistance and excellent toughness as taught by Fukaya.

74. With respect to Claims 23-25, Fukaya in view of Hirano in view of Sheeja as evidenced by Ohring teaches the formation of a film with a maximum compressive stress present at the surface of the film, decreasing said compressive stress to a first intermediate point located between the top surface and bottom surface and then increasing the said compressive stress from said first intermediate point toward the bottom surface.

75. Fukaya in view of Hirano in view of Sheeja as evidenced by Ohring does not specifically teach the compressive stress increasing from said first intermediate point to

a second intermediate point between said first intermediate point and said bottom surface and attaining a relative maximum compressive stress at said second intermediate point.

76. However, Fukaya further teaches multiple steps in the compressive stress profile, both increasing and decreasing (Figures 3 and 5, respectively). Hirano teaches a specific embodiment of having a continuously decreasing compressive stress from the top surface of the film to the bottom surface (substrate side) of the film (col. 10, Example 1, Figure 8). Hirano also teaches a constant compressive stress throughout the film to just above the bottom surface (substrate side) of the film (col. 11, Example 2, Figure 10). Hirano teaches a continuous increase in compressive stress from the top surface of the film to a first intermediate point in the film (maximum compressive stress) and then decreasing the compressive stress toward the bottom surface of the film (col. 13, Example 4, Figure 13). Finally, Hirano also teaches the stepwise increase of the compressive stress from the top surface of the film to an intermediate point in the film and then the stepwise decrease from the intermediate point to the bottom surface of the film (col. 13, Example 5, Figure 15).

77. The steps of decreasing and increasing the compressive stress as taught in separate films of Fukaya and the steps of the increasing compressive stress, i.e., decreasing substrate bias, as taught by Hirano may be interpreted as alternating and repeating manner of relative minimums and maximums in the film (formed at 4, 8, 12 and 16 minutes in Hirano). This alternation of minimums and maximums of compressive stress in the overall film can also be interpreted as a plurality of individual

layers, as both Fukaya and Hirano have taught the formation of a film with a single compressive stress and then the combination of these individual layers, as noted above. Sheeja has taught that the alternation of these compressive stress layers improves adhesion between the layers (5. Conclusion). Sheeja also teaches that one of ordinary skill in the art would be motivated to optimize the thickness and other parameters, such as substrate bias during the film formation (page 438, 5. Conclusion).

78. Therefore it would have been obvious to one of ordinary skill in the art at the time of the invention to modify the coatings of Fukaya in view of the two layer profile as taught by Hirano in view of Sheeja as evidenced by Ohring via the varying thickness of Sheeja and to modify the film of Fukaya in view of Hirano in view of Sheeja to include multiple relative minimums and maximums in the film with vary thicknesses. One of ordinary skill in the art at the time of the invention would have been motivated to do this to provide a film with excellent abrasion resistance and excellent toughness as taught by Fukaya. It would be expected that modifying the compressive stress of the film at varying intermediate points in the film would result in increasing adhesion between layers/phases and preventing delamination of the film while providing a low wear rate material as evidenced by Sheeja.

79. With respect to Claim 26, Fukaya teaches that the compressive stress is in the range of 0 to 10GPa (paragraph [0009]). Sheeja further teaches that a substrate bias of 85 V results in a compressive stress of about 10GPa (page 435, 3.3 Compressive stress of the film, Figure 3) and that a substrate bias of greater than 3000 V is approximately 1GPa (page 435, 3.3 Compressive stress of the film, Figure 3).

Therefore it would be expected by one of ordinary skill in the art that the compressive stress at any point in the film of Hirano in view of Sheeja as evidenced by Ohring would be in the range from at least -10GPa to at most -1GPa, as shown in Sheeja (Figure 3).

80. Therefore it would have been expected by one of ordinary skill in the art that the film of Fukaya in view of Hirano in view of Sheeja as evidenced by Ohring would be in the range of 0 – 10 GPa.

81. With respect to Claim 27, Fukaya teaches films of similar thicknesses (Table 3). Fukaya also teaches forming steps in the compressive stress profile located approximately at $1/8^{th}$ (approximately 12.5%) intervals of the film thickness (Figure 3).

82. Hirano in view of Sheeja, as evidenced by Ohring teaches varying the acceleration voltage in a controlled fashion such that it starts at 2000 V, is varied in a constant manner to a minimum at 10 minutes and then increased back to the starting point of 2000 V (col. 13, Example 4, lines 19-25, Figure 13). The film forming time is shown to be 20 minutes (Figure 13). The intermediate point is interpreted as being located at a position distant from the top surface of the coated film by 50% of the thickness of the film.

83. Fukaya in view of Hirano in view of Sheeja as evidenced by Ohring does not specifically teach a first intermediate point that is located at a position distant from said surface of said coated film by at least 0.1% to at most 40% of the thickness of said coated film.

84. However, because Hirano teaches the ability to obtain a relative maximum located at 20% of the film's thickness and Fukaya teaches forming relative minimums

and maximums in the compressive stress profile at approximately 12% of the film's thicknesses, it would have been obvious to one of ordinary skill in the art at the time of the invention to have a first intermediate point of the multiple relative maximums of compressive stress, as noted above, at 0.1-40% of the film's thickness distant from the top surface.

85. Therefore it would have been obvious to one of ordinary skill in the art at the time of the invention to modify the coatings of Fukaya in view of the two layer profile of Hirano in view of Sheeja as evidenced by Ohring resulting in an intermediate point located at a position distant from the top surface of the coated film by at least 0.1% to at most 40% of the thickness of the film. One of ordinary skill in the art at the time of the invention would have been motivated to do this to provide a film with excellent abrasion resistance and excellent toughness as taught by Fukaya.

86. With respect to Claim 28, Fukaya teaches films of similar thicknesses (Table 3). Fukaya also teaches forming steps in the compressive stress profile located approximately at $1/8^{th}$ (approximately 12.5%) intervals of the film thickness (Figure 3). Therefore the second point is located at approximately 25% of the films thickness from the surface. Fukaya does not teach a second intermediate point that is located at a position distant from said surface of said coated film by at least 0.2% to at most 80% of the thickness of said coated film.

87. Hirano in view of Sheeja as evidenced by Ohring teaches the formation of stepwise increases in the compressive stress from the surface of the carbon film to the intermediate point of the film and then the stepwise decrease of the compressive stress

from the intermediate point to the bottom surface of the film (col. 13, Example 5, Figure 15). The first step point below the surface of the film is for the final 4 minutes of growth and the second step point below the surface of the film is at 12 minutes into the growth (col. 13, lines 55-61, Figure 15). This is interpreted as being located at 40 % of the film's thickness distant from the top surface, as noted above in the rejection of Claim 27.

88. Therefore it would have been obvious to one of ordinary skill in the art at the time of the invention to modify the coatings of Fukaya in view of the two layer profile as taught by Hirano in view of Sheeja as evidenced by Ohring. It would have been obvious to one of ordinary skill in the art at the time of the invention to have a first intermediate point of the multiple relative minimums and maximums of compressive stress as noted above at 20 % of the film's thickness distant from the top surface and said second intermediate point at 40 % of the film's thickness distant from the top surface. One of ordinary skill in the art at the time of the invention would have been motivated to do this to provide a film with excellent abrasion resistance and excellent toughness as taught by Fukaya. It would be expected that modifying the compressive stress of the film at varying intermediate points in the film would result in increasing adhesion between layers/phases and preventing delamination of the film as evidenced by Sheeja.

89. With respect to Claim 29, Fukaya teaches forming a maximum compressive stress at the surface of the film (paragraph [0007], Figures 2 and 3).

90. With respect to Claim 30, Fukaya in view of Hirano in view of Sheeja as evidenced by Ohring as noted above teaches multiple relative minimums and maximums in the film with varying thicknesses.

91. Fukaya teaches a maximum and minimum compressive stress at the surface of the film and the stepwise decrease and increase of the compressive stress profiles (Figures 3 and 5). Hirano further teaches a maximum of compressive stress at an intermediate point (col. 13, Example 4, Figure 13) and a stepwise decrease from an intermediate maximum to the substrate (col. 13, Example 4, Figure 15). Hirano teaches that the step from the intermediate point with a maximum compressive stress to the next point in the stepwise decrease of compressive stress to the substrate is from 200 V to 1000 V.

92. Sheeja teaches that a compressive stress of 10 GPa is introduced with a substrate bias of 85 V while a substrate bias of 3000 V introduced a 1 GPa compressive stress.

93. Fukaya in view of Hirano in view of Sheeja as evidenced by Ohring does not expressly teach said compressive stress at said second intermediate point of said coated film is set to a value comparable to 10 to 80 % of the compressive stress at said first intermediate point of said coated film.

94. However, a step corresponding to 3000 V to 85 V in Sheeja would be expected to produce a second intermediate point with approximately 10 % of the compressive stress of the first intermediate point. Therefore it would be expected by one of ordinary skill in the art that a step corresponding to 200 V and 1000 V as seen in Hirano would produce a second intermediate point with at least 10 % of the compressive stress but not more than 80 % of the compressive stress of the surface.

95. Therefore it would have been obvious to one of ordinary skill in the art at the time of the invention to modify the multiple steps of Fukaya in view of Hirano in view of Sheeja as evidenced by Ohring via the optimization of Sheeja for the purpose of creating multiple relative maximums and minimums in the carbon film. One of ordinary skill in the art at the time of the invention would have been motivated to do this to provide a film with excellent abrasion resistance and excellent toughness as taught by Fukaya. It would be expected that modifying the compressive stress of the film at varying intermediate points in the film would result in increasing adhesion between layers/phases and preventing delamination of the film as evidenced by Sheeja.

96. With respect to Claim 31, Fukaya in view of Hirano in view of Sheeja as evidenced by Ohring teaches varying the compressive stress in a stepwise manner throughout the coated film. Sheeja teaches that one of ordinary skill in the art would be motivated to optimize the film by varying the substrate bias and film thicknesses (page 438, 5. Conclusion).

97. Fukaya in view of Hirano in view of Sheeja as evidenced by Ohring does not specifically teach said compressive stress at said first intermediate point of said coated film is set to a value comparable to 20 to 60% of the compressive stress at the surface of said coated film.

98. However, it would have been obvious to one of ordinary skill in the art at the time of the invention to modify compressive stress of said first intermediate point so that it was set to a value comparable to 20 to 60 % of the compressive stress of said surface of the coated film for the purpose of optimizing the adhesion strength, wear resistance

and hardness. One of ordinary skill in the art at the time of the invention would have been motivated to do this to provide a film with excellent abrasion resistance and excellent toughness as taught by Fukaya. It would be expected that modifying the compressive stress of the film at varying intermediate points in the film would result in increasing adhesion between layers/phases and preventing delamination of the film as evidenced by Sheeja.

99. With respect to Claim 32, Fukaya teaches an example wherein the maximum compressive stress is attained at the surface of said coated film and is maintained across a prescribed distance from said surface toward a first intermediate point and after this point the compressive stress continues to decrease in a stepwise fashion (Figure 3). Fukaya also teaches an example in which the compressive stress is continuously decreased from the surface of the film to the substrate (Figure 2).

100. Therefore it would have been obvious to one of ordinary skill in the art at the time of the invention to modify the coatings of Fukaya in view of the two layer profile as taught by Hirano in view of Sheeja as evidenced by Ohring so that the compressive stress is a maximum at the surface, is maintained across some prescribed distance toward the intermediate point. One of ordinary skill in the art at the time of the invention would have been motivated to do this to provide a film with excellent abrasion resistance and excellent toughness as taught by Fukaya.

Response to Arguments

101. Applicant's amendment of Claims 3, 9, 16 and 26 is acknowledged and the 112, second paragraph rejection is withdrawn.

102. Applicant's arguments filed October 15, 2009 have been fully considered but they are not persuasive.

103. Applicant argues that Hirano teaches an inverted state of the compressive stress distribution as claimed by applicant.

104. The examiner agrees with applicant that Hirano teaches an inverted state of compressive stress distribution. However, Hirano is utilized as teaching a desire to vary the compressive stress distribution in a hard film. Hirano teaches that by varying the compressive stress, a desired hardness and adhesiveness is observed. Fukaya teaches films with a maximum compressive stress at the surface and films with a minimum compressive stress at the surface and teaches that if maximum toughness is desired, a maximum compressive stress should be at the surface of the film. The examiner therefore asserts that it would have been obvious to use the film of Fukaya with a maximum compressive stress at the surface and vary the compressive stress of the film as taught by Hirano to ensure not only a toughness but adhesion as well.

105. The applicant further asserts that it is improper to consider Hirano as a two-layer system. However, Hirano (col. 2, lines 21-26) states that the film can be regarded as two or more layers with individual sp^2/sp^3 ratios, i.e., compressive stress. Therefore, the examiner's use of "two-layered" system is merely semantics and the term is used to help visualize the overall structure of the film. Also, because the film of Hirano can be visualized as comprising two or more layers with individual compressive stress values, one of ordinary skill in the art would expect the combination of the layers, i.e., maximum

compressive stress to a minimum and then a minimum to a maximum, taught by Fukaya to be successful and produce the desired hardness and adhesion as taught by Hirano.

Conclusion

106. The prior art made of record and not relied upon is considered pertinent to applicant's disclosure.

107. Bull and Jones, Surface and Coatings Technology, 78, 1996, pp 173-184. Teaches structural multilayer films comprising alternating layers of low and high residual stress.

108. Holleck and Schier, Surface and Coatings Technology, 76-77, 1995, pp328-336. Teaches multilayer PVD coatings for wear protection with different inherent compressive stress values.

109. **THIS ACTION IS MADE FINAL.** Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

110. A shortened statutory period for reply to this final action is set to expire THREE MONTHS from the mailing date of this action. In the event a first reply is filed within TWO MONTHS of the mailing date of this final action and the advisory action is not mailed until after the end of the THREE-MONTH shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than SIX MONTHS from the mailing date of this final action.

111. Any inquiry concerning this communication or earlier communications from the examiner should be directed to Ronald A. Quinlan whose telephone number is (571) 270-1149. The examiner can normally be reached on Monday to Thursday from 6:30am-4:30pm Eastern.

112. If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Jennifer McNeil can be reached on (571) 272-1540. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

113. Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

/R. A. Q./
Ronald A. Quinlan
Patent Examiner, Art Unit 1794
January 29, 2010

/Jennifer McNeil/
Supervisory Patent Examiner, Art Unit 1794